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*E. Brainerd*; "Notes on algæ," by *F. S. Collins*; "A prolific gentian," by *W. Deane*; "Myosotis collina in New England," by *E. F. Williams*; "A new wild lettuce from Massachusetts," by *B. L. Robinson*; "Notes on some fleshy fungi found near Boston," by *H. Webster*; "Matricaria discoidea in eastern Massachusetts," by *W. H. Manning*; besides shorter miscellaneous notes.

There is need for just such journals, and *Rhodora* is certain to fill its mission. The GAZETTE congratulates the editors upon the appearance of the initial number, and wishes the new venture great success.—J. M. C.

THE FIRST PART of a work on the physiology of plant organization has recently been published by Professor Dr. G. Berthold,<sup>6</sup> of the University of Göttingen. No criticism of this part is possible, since it is merely a record of the observations of the author regarding (1) the anatomy of the Scitamineae, (2) the anatomy and development of certain Compositæ, Umbelliferæ, and Araliaceæ; (3) the annual shoots of *Acer Pseudoplatanus*; (4) the development of some roots and axes of Pandanaceæ and palms; (5) the structure and development of leaves and stems; (6) the red coloration of leaves and stems; (7) the dying of leaves and stems.

The discussion of the observations is promised in the second part which is to appear very soon. That may be expected to show reason for the publication of what, unexplained, seem like trivial details, proper enough in a notebook, but unusual in print. The record shows an enormous amount of work, for which we are ready to express gratitude as soon as we know what it means.—C. R. B.

#### NOTES FOR STUDENTS.

SOME USEFUL physiological data regarding the rate of growth, flowering, nutrition, and transpiration of *Nelumbo nucifera* Gærtn. are recorded (in English) by Mr. K. Miyabe in Tokyo Botanical Magazine 12:85-101, 112-117. 1898.

AT A MEETING of the botanical section of the Russian Society of Naturalists at Kiew, August 1898, Professor S. Nawaschin spoke upon his new observations on fertilization in *Fritillaria* and *Lilium*. He has found true cellulose membranes on all three cells of the sexual apparatus, which were resorbed before the entrance of the sperm nucleus into the embryo sac. Both sperm cells, he asserts, enter the embryo sac, one of them penetrating the egg, while the other copulates with the nearer polar nucleus! The latter then copulates with the other polar nucleus. The brief abstract (Bot. Cent. 77: 62. 1899) does not give further details and Nawaschin's interpretation of what

<sup>6</sup>BERTHOLD, G.—Untersuchungen zur Physiologie der pflanzliche Organisation. Erster Teil. 8vo, pp. iv + 242, pl. 1. Leipzig: Wilhelm Engelmann. M6.

seems most extraordinary and unlikely action of the second sperm will be awaited with interest.— Since the foregoing was in type, a preliminary paper has been published by Nawaschin<sup>7</sup> in which few other important facts are added. The copulation with the polar nucleus is considered as a sexual act, so that "we have to do here with a sort of polyembryony which issues in the formation of a pair of unequally developed twins, of which one develops into a segmented plant, while the other remains thallus-like and is finally consumed by the former."—C. R. B.

MR. CHARLES E. BROOKS has recently discussed<sup>8</sup> the origin and significance of spines, both in animals and plants. He endeavored to arrive at general conclusions relating to the origin and significance of spinosity. The main part of the paper is devoted to conclusions derived from the study of both living and fossil animals. The observations made on plants are somewhat superficial; the same general conclusions, however, are obtained in both plants and animals. These are that spines, whether prickles, thorns, or horns, represent "a stage of evolution, a degree of differentiation in the organism, a ratio of its adaptability to the environment, a result of selective forces, and a measure of vital power."

After some preliminary discussion on the law of variation, the growth and kinds of spines, the ontogeny of the spinose individual, and the phylogeny of spinose forms, the author classifies the causes of spines under eleven categories. With a few unimportant exceptions the spines of plants are referable to only two of these. The first is the "restraint of environment causing suppression of structures." In desert or arid regions leaves and branches may be suppressed to form spines. A secondary influence may determine the abundance of spinose plants in a region. Herbivorous animals destroy the unarmed species, and an old pasture may thus have the prevailing flora offensive to grazing animals. This does not produce spines, but merely drives out all species except those the animal cannot eat; hence the spines are not formed for protection, but merely assume that office as a result of selection.

The other category is "intrinsic suppression of structures and functions." This includes those prickles of brambles and climbing plants that are not produced by suppression of stipules, leaves, etc. The cause of these cortical eruptions, the author admits, is not clear, but he seems to favor the idea advanced by Bailey that they are connected with the general suppression of the plant body, and that they represent abortive attempts on the part of the plant to recover normal proportions. Prickles may often serve for protection and enable the plant to cling to a support, but this is not the initial cause.

Under categories of interpretation the author offers two generalizations.

<sup>7</sup> *Bull. Acad. Imp. Sci. St. Pétersb.* 9: 377-382. 1898.

<sup>8</sup> *Am. Jour. Sci.* IV. 6: 1-20, 125-136, 249-268, 329-359. 1898.

First, spinosity is a limit to variation. It is shown by the individual and the racial development that organs of various kinds are changed to spines, but spines are never changed to other organs.

Second, spinosity is the paracme of vitality. Spiny plants are "always given to die back," "often prune themselves." Spines are more or less dead structures with special physiological function. The internal or physiological changes take place in the early life of the group, while the external differentiations come about at a later period, and in this spinosity is the limit. "Spines then indicate a fixity of physiological characters together with the consequent inability of the organisms to change due to decreasing vitality."

—H. N. WHITFORD.

MR. BERNHARD JACOBI (with the assistance of Professor Dr. Stahl of Jena) has prepared a summary of recent researches on proteid formation in green plants. From the *Biologisches Centralblatt* 18:602. 1898, we translate:

"The present state of our knowledge concerning the place and conditions for the formation of proteids in green plants . . . is as follows:

"The special center for the synthesis of proteids is the foliage leaf.

"In the cells participating directly in proteid formation this process (under otherwise normal conditions of vegetation) may be begun in darkness, since carbohydrates enter into reaction with nitric acid, ammonia or amides to this end. But how far the process mentioned progresses depends on the amount of available carbohydrates.

"If the latter are present in abundance the formation of proteids will take place. If, on the contrary, only small amounts of carbohydrates are available, the process ceases in darkness with the formation of amides. Therefore when an adequate augmentation of the carbohydrates is provided for proteid can be produced.

"The supplying of these carbohydrates may be accomplished either artificially or naturally. In the first case the synthesis of proteids may be accomplished in darkness. By the natural method the carbohydrates could only be augmented to an adequate amount by providing, through the access of light, the conditions for assimilation of carbonic acid. In this case the light cooperates indirectly in the synthesis of proteids, because it provides the carbohydrate by the process of assimilation.

"The special source of energy is furnished by the carbohydrates themselves. However, in many cases light also appears to play a part as a source of energy. Godlewski found that, even in air free of carbonic acid, illuminated seedlings were able to form proteids from nitrates and sugar. And Detmer thinks that in this case light 'has a special importance as a source of energy' because only small amounts of carbohydrates were available."—C. R. B.

A RECENT PAPER by Dr. B. M. Davis<sup>9</sup> is of more than usual interest, as it contains the first description of the process of nuclear division in one of the Rhodophyceæ. The studies were carried on at Naples and at Bonn, and the tetraspore mother-cell of *Corallina*, one of the lime-encrusted red algæ, was selected. The nuclear figure in metakinesis is especially interesting because of the remarkable differentiation of the kinoplasm into two beautiful centrosphere-like bodies at the poles of the spindle. The centrospheres are very large homogeneous bodies without centrosomes. They arise from accumulations of kinoplasm at the opposite ends of elongated nuclei entering prophase conditions. The spindle fibers develop from these regions of differentiated protoplasm, finally appearing as extensions from the outer surface of the centrospheres. The chromatin is scattered in a very finely divided condition through the nuclear plasm, which is homogeneous in structure and lacks the usual linin network. After the division at the nuclear plate the two sets of split chromosomes are drawn up to the centrospheres, finally lying against their surfaces. Here the chromosomes of each set gradually fuse together into one larger chromatin body. The outline of each centrosphere meanwhile becomes ill-defined, and the structure loses its distinctness as a differentiated region of protoplasm, changing into an irregular dense mass, into the midst of which is drawn the chromatin body. A nuclear membrane then appears around and at a little distance from the chromatin body. The daughter nuclei thus have at first only the large chromatin body. Later the nucleolus appears, at first smaller than the chromatin body but soon growing larger. The chromatin body begins to fragment, which process finally reduces that material to the form of minute granules inside the nucleus and around the single large nucleolus. The centrosphere completely disappears as a differentiated region of the protoplasm, leaving no trace of its former presence. It seems to be the morphological expression of certain activities of the protoplasm concerned with nuclear division. There is no evidence that it is a permanent organ of the cell.—J. M. C.

<sup>9</sup> Kerntheilung in der Tetraspormutterzelle bei *Corallina officinale* L. var. *mediterranea*. Ber. d. deut. botan. Gesell. 16 : 266. 1898.